

Claims for Proposed Patent Application on Chemical Monolayer and Micro-Electronic
Junctions and Devices Containing Same

Inventor: Richard L. McCreery

What is claimed is:

Basic Chemical Monolayer Construction/ Based upon "Strong Electronic Coupling"

1. A **chemical monolayer** construction, said construction comprising:
 - (a) a **substrate** having a contact surface; and
 - (b) a **monolayer of a plurality of substantially parallel molecular units** attached to said contact surface of said substrate, wherein said molecular units are **attached to said substrate so as to be strongly coupled electronically to said substrate and wherein** said molecular units have an **average length**, said contact surface of said substrate has a **roughness value** that is **substantially less than or equal to said average length of said molecular units**.
2. A chemical monolayer construction according to claim 1 wherein said substantially parallel **molecular units are of substantially the same lengths**.
3. A chemical monolayer construction according to claim 1 wherein said substantially parallel molecular units comprise at least **two types of molecular units** that are of **different lengths**.
4. A chemical monolayer construction according to claim 1 wherein said substrate **comprises electrically conductive carbon**.
5. A chemical monolayer construction according to claim 1 wherein said substrate **consists essentially of electrically conductive carbon**.

6. A chemical monolayer construction according to claim 1 wherein said substrate consists essentially of **pyrolyzed conductive carbon**.
7. A chemical monolayer construction according to claim 1 **additionally comprising a source of electrical current** supplied to said substrate so as to be conducted by said plurality of substantially parallel molecular units.

Basic Chemical Monolayer Construction/ Based upon Conjugated Bonding

8. A **chemical monolayer** construction, said construction comprising:
 - (a) a **substrate** having a contact surface; and
 - (b) a **monolayer of a plurality of substantially parallel molecular units** attached to said contact surface of said substrate, wherein said molecular units are attached to said substrate through a **conjugated bond**.
9. A chemical monolayer construction according to claim 8 wherein said substrate **comprises conductive carbon**.
10. A chemical monolayer construction according to claim 8 wherein said substrate **consists essentially of conductive carbon**.
11. A chemical monolayer construction according to claim 8 wherein said substrate consists essentially of **pyrolyzed conductive carbon**.
12. A chemical monolayer construction according to claim 8 wherein said **molecular units have an average length**, said contact surface of said substrate has a **roughness value** that is **substantially less than or equal to said average length** of said molecular units.
13. A chemical monolayer construction according to claim 8 wherein said substantially parallel **molecular units** that are of substantially the **same length**.

14. A chemical monolayer construction according to claim 8 wherein said substantially parallel molecular units comprise **at least two types of molecular units of different lengths**.
15. A chemical monolayer construction according to claim 8 wherein said roughness value is less than **200 Angstroms**.
16. A chemical monolayer construction according to claim 8 wherein said roughness value is less than **20 Angstroms**.
17. A chemical monolayer construction according to claim 8 wherein said roughness value is less than **5 Angstroms**.
18. A chemical monolayer construction according to claim 8 **additionally comprising a source of electrical current** supplied to said substrate so as to be conducted by said plurality of substantially parallel molecular units.

Basic Electronic Junction

19. An electronic junction comprising:
 - (a) a **first conductive component**, said first conductive component comprising:
 - (i) a **substrate** having a contact surface; and
 - (ii) a **monolayer** of plurality of substantially parallel molecular units having first and second ends, and attached through their first ends to said contact surface **through a conjugated bond**; and
 - (b) a **second conductive component** in **electrical contact** with said second ends of said substantially parallel molecular units.
20. An electronic junction according to claim 19 wherein said first conductive component **comprises electrically conductive carbon**.

21. An electronic junction according to claim 19 wherein said substantially **parallel molecular units that are of substantially the same length**.
22. An electronic junction according to claim 19 wherein **second conductive component is chemically bound** to said second ends of said substantially parallel molecular units.
23. An electronic junction according to claim 19 wherein at least some of said **molecular units comprise a moiety capable of binding at least one chemical species** so as to **alter the electronic character** of said at least some of said molecular units.
24. An electronic junction according to claim 19 wherein at least some of said **molecular units comprise a moiety capable of binding a metal ion** so as to **alter the electronic character** of said at least some of said molecular units.
25. An electronic junction according to claim 19 wherein at least some of said molecular units are sensitive to **incident electromagnetic radiation** which may **alter the electronic character** of said at least some of said molecular units.
26. An electronic junction according to claim 25 wherein at least one of said first and second conductive components is **translucent**.
27. An electronic junction according to claim 19 wherein at least some of said molecular units form a molecular orbital such that **the passage of current** through at least some of said molecular units causes the **emission of electromagnetic radiation** from said at least some of said molecular units.
28. An electronic junction according to claim 27 wherein said electromagnetic radiation is visible light.

29. An electronic junction according to claim 27 wherein said electromagnetic radiation is infrared light.
30. An electronic junction according to claim 27 wherein said electromagnetic radiation is amplified.
31. An electronic junction according to claim 27 wherein at least one of said first and second conductive components is **translucent**.
32. An electronic junction according to claim 19 wherein at least some of said molecular units are sensitive to **the passage of current** such that the **passage of current** through at least some of said molecular units causes a **change in the reflectivity or transmissibility of said monolayer**.
33. An electronic junction according to claim 19 wherein at least some of said molecular units are sensitive to the **incidence of electromagnetic radiation** such that the **incidence of electromagnetic radiation** on at least some of said molecular units causes a **change in the reflectivity or transmissibility** of said monolayer.
34. An electronic junction according to claim 19 wherein at least some of said molecular units form an arrangement of molecular orbitals such that said electronic junction is capable of **functioning as a semiconductor**.

Pixel Array/Digital Camera/Display

35. A **pixel array** comprising a plurality of pixels, each pixel comprising:
- (a) a **first conductive component**, said first conductive component comprising:
 - (i) a substrate having a contact surface; and

- (ii) a **monolayer** of a plurality of substantially parallel molecular units having first and second ends, and attached through its first end to said contact surface through a **conjugated bond**; and
- (b) a **second conductive component** in electrical contact with said second ends of said substantially parallel molecular units;
- wherein at least some of said molecular units form a molecular orbital such that **incident electromagnetic radiation** may **alter the electronic character** of said at least some of said molecular units.
36. An pixel array according to claim 35 wherein at least one of said first and second conductive components is **translucent**.

Pixel Array

37. A **pixel array** comprising a plurality of pixels, each pixel comprising:
- (a) a **first conductive component**, said first conductive component comprising:
- (i) a **substrate** having a contact surface; and
- (ii) a **monolayer** of a plurality of substantially parallel molecular units having first and second ends, and attached through its first end to said contact surface **through a conjugated bond**; and
- (b) a **second conductive component** in electrical contact with said second ends of said substantially parallel molecular units;
- wherein at least some of said molecular units form a molecular orbital such that the **passage of current** through said at least some of said molecular units **causes the emission of electromagnetic radiation** from said at least some of said molecular units.

38. A pixel array according to claim 37 wherein at least one of said first and second conductive components is **translucent**.

Multi-layer / Two-Layer Electronic Junction

39. An electronic junction comprising:

- (a) a **first conductive component**, said first conductive component comprising a first contact surface;
- (b) a **monolayer of a first plurality of substantially parallel first molecular units** having first and second ends, each of said parallel first molecular units of substantially the same length and attached through its first end to said first contact surface **through a conjugated bond**;
- (c) a **second conductive component** having first and second sides, said first side **in electrical contact** with said second ends of said parallel first molecular units, and said second side having a second contact surface;
- (d) a **monolayer of a second plurality of substantially parallel second molecular units** having first and second ends, each of said parallel second molecular units attached through their first end to said second contact surface **through a conjugated bond**; and
- (e) a **third conductive component** having first and second sides, said first side **in electrical contact** with said second ends of said parallel second molecular units.

40. An electronic junction according to claim 39 wherein said first side of said second conductive component is **covalently bound** to said second ends of said parallel first molecular units.

41. An electronic junction according to claim 39 wherein said first side of said third conductive component is **covalently bound** to said second ends of said parallel second molecular units.

Memory Device

42. A memory device, said memory device comprising:
- (a) a **rigid support**;
 - (b) a **substrate disposed on said rigid support and** having a contact surface; and
 - (c) a **monolayer** of plurality of substantially parallel molecular units having first and second ends, and attached through their first ends to said contact surface **through a conjugated bond, and said second ends defining a scan surface, said molecular units adapted to be changed between a first memory state and a second memory state**; and
 - (d) a read-write device adapted to move along said scan surface and adapted to stimulate a change of said **molecular units between said first and second memory states, and to determine the memory state status of regions on said scan surface.**

Field Emitter Device

43. A field emitter device, said device comprising:
- (a) a planar **rigid support**;
 - (b) a **substrate disposed on said rigid support and** having a **contact surface** and **defining a plurality of extensions extending from said rigid support**; and

- (c) a **monolayer of plurality of substantially parallel molecular units** having first and second ends, and attached through their first ends to said contact surface through a **conjugated bond**, and said **second ends defining an emission surface**, said molecular units adapted to emit electrons in response to an **applied potential**;
- (d) a source of an applied potential adapted to stimulate said **molecular units to emit electrons**; and
- (e) a **planar emitter material disposed facing said plurality of extensions and comprising a material adapted to emit light upon stimulation by incident electrons**.

Method of Constructing a Chemical Monolayer

44. A method of producing a **chemical monolayer** construction, said method comprising:
- (a) providing a **substrate** having a contact surface; and
- (b) reacting a chemical precursor bearing molecular units with said substrate so as to form a **monolayer of a plurality of substantially parallel molecular units** attached to said contact surface of said substrate, wherein said molecular units are **attached to said substrate so as to be strongly coupled electronically to said substrate and wherein** said molecular units have an **average length**, said contact surface of said substrate has a **roughness value substantially less than or equal to said average length of said molecular units**.

45. A method of producing a **chemical monolayer** construction according to claim 44 wherein said wherein said molecular units become attached to said substrate through a **conjugated bond**.
46. A method of producing a **chemical monolayer** construction according to claim 44 wherein said substrate **comprises conductive carbon**.

Method of Constructing an Electronic Junction

47. A method of producing an electronic junction, said method comprising:
- (a) providing a **first conductive component**, said first conductive component comprising:
- (i) a **substrate** having a contact surface; and
 - (ii) a **monolayer** of plurality of substantially parallel molecular units having first and second ends, and attached through their first ends to said contact surface **through a conjugated bond**; and
 - (iii) placing a **second conductive component** in **electrical contact** with said second ends of said substantially parallel molecular units.
48. A method of producing an electronic junction according to claim 47 wherein said **second conductive component is chemically bound** to said second ends of said substantially parallel molecular units.
49. A method of producing an electronic junction according to claim 47 wherein said **second conductive component is covalently bound** to said second ends of said substantially parallel molecular units.